



PROVINCE OF BRITISH COLUMBIA.

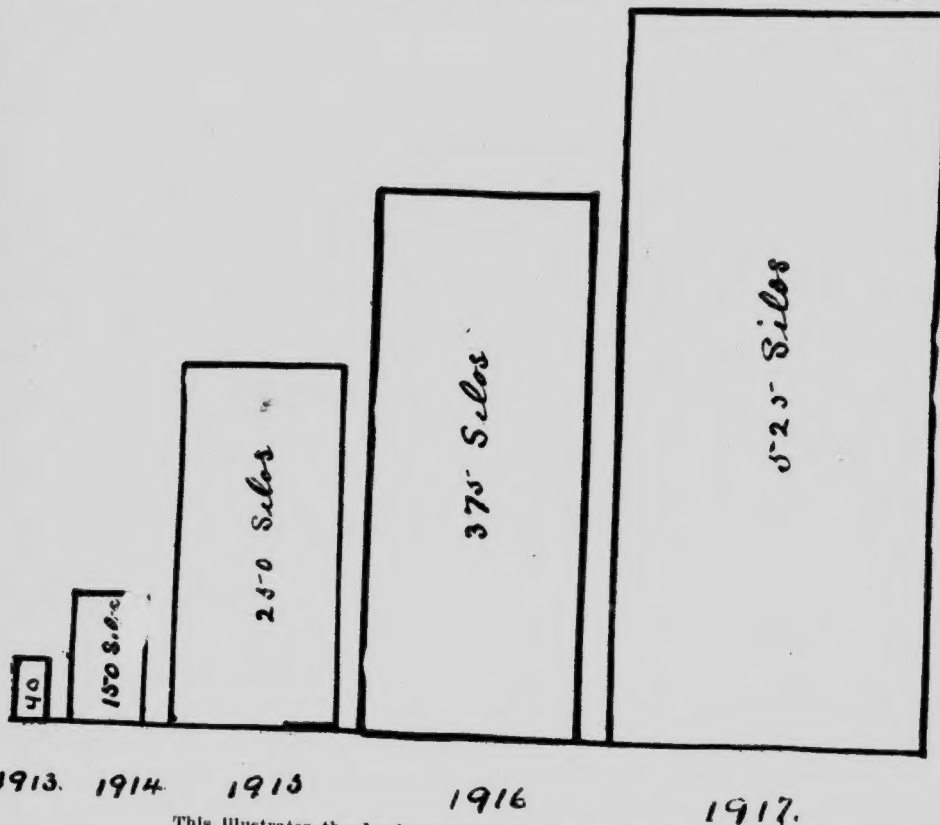
DEPARTMENT OF AGRICULTURE
(LIVE STOCK BRANCH).

SILAGE AIDS PRODUCTION.

BY R. J. FERRIS, SILO DEMONSTRATOR.



THE Live Stock Branch, with the purpose of assisting the farmers to provide cheap succulent food for their live stock, inaugurated a campaign in the summer of 1914, under the supervision of Professor W. T. McDonald, Live Stock Commissioner, to show the benefits which are derived from silage as an aid more especially to beef and milk production. One of the reasons for commencing this work was the fact that there were so few silos in the Province. Only a small number of our farmers were familiar with the use of silage, and, in addition to this, a large



This illustrates the development of silos in British Columbia.

number of farmers knew enough about it to condemn it, because, as was stated, it causes the cows' teeth to rot, taints the milk, not practicable, etc. Therefore, there was a great opportunity for educational work with reference to silos. In bringing before the farmers a scheme which to them was new and involved the outlay of additional capital, it was thought that the better way would be to give them a practical demonstration of the work, both as to building and filling. The farmers upon whose farms the silos have been built and filled proved to be splendid agents for advertising the benefits of silage, when their cows were giving the increased yields of milk.



Home-made silos in use on Vancouver Island. (Note the rack used for hauling the corn.)

The type of silo built by the Department in the initial stage was the rough stave silo with posts. This type was adopted because of the low cost of construction, and though not possessing the finish that a silo of the manufactured type does, it brought the possibility of a silo to the small farmer as well as those who were able to build more expensive ones. With a little care during the summer, we were convinced it would produce good silage. This has been proved, for a number of this type of silo erected by the Department have been in use three seasons, and are giving the best results. When advocating the rough stave silo it was always made clear that it was principally because of the low cost.

During the past year or two the silos have been constructed to suit the farmers; some had the rough staves, others tongued, grooved, and bevelled, knuckle-jointed, etc.

A 4½-horse-power engine and an ensilage-cutter fitted with elevators were purchased; these were mounted on a truck to aid in transportation. Though the blower is the popular type of filler, we have a number of farmers in the Province who have built their own elevators, and are filling their silos with small-powered engines successfully.

In the spring of 1915 the Department purchased a No. 9 silage-cutter with blower attached; this was driven by a 6-horse-power gasoline-engine which had been exchanged for the 4½ horse-power. This machine has filled a large number of silos while it has been in our possession, and is very useful for the farmer who has a small-sized silo and decides on filling his silo with a small crew. The factor that controls the size of crew is the capacity of the silage-cutter, and the only way you can ensure the cutter working to full capacity is by having sufficient power to drive it, and a little to spare.



Filling a silo with corn (No. 15 ensilage-cutter) near Victoria.

In 1917 the Department purchased a No. 13 ensilage-cutter, and this has enabled us to put 50 tons per day into a silo. Fifty-three silos have been erected by the Department since the commencement of this campaign—that is, the silo with the posts instead of the all-stave—and forty-two have been filled. More than 50 per cent. of the silos in the Province are of the type adopted by the Department of Agriculture. Despite this, the farmers as a body are just commencing to see the value of this system of feeding. Take the whole stretch of the Grand Trunk Railway from Prince Rupert to Alberta, and you will only find one silo.

The main purpose of this circular is to impress upon the farmer of British Columbia the necessity of building a silo on his farm, which, with proper attention, to use the words of a number of farmers who have written to the Department, pays for the cost of construction the first year through added production. It is recognized as an important part of the farmer's equipment. The farmers of this Province are finding it a great factor in lowering the cost of feeding their live stock.

SILOS BUILT AND FILLED.

	Silos built.	Silos filled.
1914	5	7
1915	13	11
1916	12	11
1917	23	13
Totals	53	42

CROPS USED TO FILL THE SILOS.

	Corn.	Alfalfa.	Oats.	Peas and Oats.	Corn and Clover.	Corn and Alfalfa.
1914	7	...	...	...	...	...
1915	10	...	...	1	...	...
1916	5	2	3	...	1	...
1917	8	1	2	1	...	1

PRINCIPAL FACTORS IN SILO-CONSTRUCTION.

There is a great amount of controversy regarding the type of silo which is the best to build. There are a good many types, such as stave, concrete, concrete blocks, concrete staves, brick, tile, metal, etc. Investigation has shown that the material used in the construction has little, if any, influence upon the silage. The factors to be considered in building or buying a silo are economic ones, such as first cost, cost of maintenance, and durability.

The essential things in silo-construction are to have an air-tight wall, smoothness on the inside so that the silage can settle properly, and sufficient strength so that the wall can withstand the lateral pressure.

MATERIAL FOR STAVES PLentiful.

Lumber is plentiful in British Columbia, and in the Douglas fir we have material which is well adapted for the erection of silos. This was taken into consideration when adopting the stave silo as a standard type for the Province. A large number of our farmers have timber on their farms, and they have hauled enough logs to the sawmill to provide material not only for the silo, but to also pay for the cost of cutting. In this manner they have brought the cost of construction to a low figure. Hemlock has been used to advantage in the Interior of the Province.

RODS AND WASHERS.

Owing to the increased cost of iron the rods are an important item in the cost of building. A number of farmers are buying the iron and threading the rods during their spare time in the winter. By using this method one farmer in the Okanagan last year saved 50 per cent, on the quoted price of rods threaded and bent to the circle. The washers which are used with the silo recommended by the Department should always be malleable or cast iron; these cover a larger surface and are not apt to be drawn into the wood. It makes a big difference in the time of construction, using the method of staging adopted by the Department, if the rods are carefully bent to the circumference of the silo.

SIZE AND CAPACITY.

The success or failure of your silage depends on the area exposed and rate at which it can be used. To keep the silage fresh it is advisable to feed off the surface at least 1 inch in winter and 2 inches in summer, daily. Care must be taken to keep the surface level; this can be done by raking off the silage. A number of our

farmers dig into the silage sometimes to an unusual depth. Unless the farmer is feeding a very large herd of stock, a lot of feeding value will be lost by this method, through harmful bacteria. The number of cows should decide the size of the silo. It is not considered wise to build a silo for less than ten head, but we have farmers feeding seven head of stock in winter from a silo 10 feet in diameter, with success. Build your silo in height at least twice the diameter. The following table will assist you in arriving at the capacity of the silo you wish to build:—

Diameter of Silo in Feet.	Weight contained in 1 Inch Depth of Silage taken from the Surface of a 20-foot Silo.	No. of Cows it will Feed, allowing from 35 to 40 Lb. per Day.
10	Approx. 262 lb.	7
11	" 317 "	8
12	" 377 "	10
13	" 440 "	12
14	" 513 "	14
15	" 589 "	16
16	" 670 "	18

LOCATION.

In locating your silo, be sure that adequate space is left to accommodate the engine and silage-cutter when the filling-time comes around. A lot of valuable time is wasted through the teams and wagons not being able to approach the silage-



Corn is being used to advantage for silage by British Columbia farmers, especially in the Okanagan.

cutter. The silo should be as near the feeding-alley as possible. Place it near enough to the barn so that when the chute is built it can be attached to the barn; this will act as an anchor to the silo. A door can be placed in the wall of the barn opening into the chute. The chute, if necessary, would make a ventilator, and the warm air from the barn would assist in keeping the frost away from the silage in winter. Apart from this, it is very convenient for the man who feeds the cattle.

BEST TIME TO HARVEST THE CROP FOR SILAGE PURPOSES.

It is well to always remember in the ensiling of crops this fact: that the nearer the crop is to maturity, the heavier will be your yield of dry matter. One of the principal reasons why farmers get discouraged with the silo is because the yield of silage does not come up to their expectations. This very often is caused through placing an immature crop in the silo, sometimes getting 50 per cent. or less of what the crop would have been if it had reached maturity.

CORN.

In ordinary seasons there is a period lasting but a few days in which the corn ears are ripe and the leaves and stalks are green. This is the ideal time for putting it into the silo. If corn is allowed to mature beyond this stage, water should be added to the cut material to prevent "fire-fanging" of the silage. Silage from ripe corn is being generally adopted throughout the United States. Proved authorities on silage still advocate putting corn into the silo when it is in the glazed stage, but our investigations point to the more advanced stage of maturity.

In 1914 we filled a small silo at Chilliwack with ripe corn as an experiment; the silage was in good condition, but the cattle did not relish it like they did the corn, which was not in the mature stage. Later experiments have proved that this was due to lack of moisture.

OATS, WHEAT, BARLEY, PEAS, ETC.

In using any of these crops for silage, if harvested too immature, you not only lose a large amount of dry matter from your crop, but it is sometimes very difficult to harvest because of the canvas on the binder getting wet and forage clogging on the rollers. If the crop has to be cut with the mower, the extra expense caused by additional handling sometimes reaches a high figure. The best time to ensile any of the crops mentioned above is when you notice the field beginning to turn from the green to the ripening colour. By picking up an individual plant this would be noticed, but by taking a glance at the crop in the field the change is noticeable. If one portion of the crop is advanced ahead of the other, you would have to use your own judgment. We have ensiled ripe oats, but find it is better to cut the crop while there is yet a certain amount of moisture in the stalk. It is necessary to add water to oats that are on the dry side.

ALFALFA AND CLOVER.

Alfalfa and clover have been used in various parts of the Province for silage purposes with good results. In some parts of British Columbia three and sometimes four cuttings of alfalfa are harvested in the season. Alfalfa should be siloed when the crop is one-third in the bloom. If it is left in the field until the mature stage, the stalks of the plant get woody; this impairs the quality of the silage. By cutting the alfalfa at the earlier stage you get the leaves in the silo and the subsequent crop is not retarded. With clover it is advisable to cut the crop when it is in full bloom. There are sections of our Province where it is sometimes difficult to make hay, because living as we do in a mountainous country the climate is more subject to variations. There is no danger of losing your crop if the silo is available, and there are instances where the silo has saved for the farmer the value of its construction in one year, through taking care of a crop which would have been a total loss through inclement weather.

MIXED SILAGE.

Oats and peas make an excellent silage-crop. A glance at the table giving the quantity of digestible dry matter in 100 lb. of succulent roughage shows results which place oats and pea silage on a parallel with corn. Oats and vetch also make profitable silage, yielding a large amount of roughage. Sometimes the corn crop, or whatever other crop has been set aside for the silo, does not give you the desired amount of silage. You can supplement this with another crop. We placed mixtures such as peas, oats, barley and clover, corn and clover, etc., without any noticeable injurious effect to the silage. Before adding the supplementary crop remove all the spoiled material, if any, off the surface of the silage.

CREW.

It is difficult to state how many men, teams, and wagons are necessary for the filling of a silo. These matters to a great extent have to be left to the judgment of

the farmer. A great deal depends upon the distance the crop has to be hauled and the capacity of the silage-cutter. We filled a silo 12 x 30 feet with a No. 9 cutter, the field being alongside the silo. The crew in this case were six men: Cutting, 1; loading, 1; hauling, 1; throwing to feeder, 1; run the engine and feed, 1; tramping, 1.

By this method only one team and two wagons were used. When the load had been hauled to a position near the cutter, the man in charge of the team would unhitch and hitch up to another wagon. After the man who was throwing off the material had finished the load, the wagon was pushed forward by hand, in order to allow the next load to be hauled to its position. One advantage of this system is that it saves the farmer with one team hiring another outside the farm. For the large silos, and where the field is at some distance from the silo, you will need additional teams, wagons, and men. In this case the man who hauls the load to the silo unloads it, and two men can be kept busy in the field loading, especially in the case of oats or other crops which are harvested in the sheaf. In harvesting corn the corn-blender is the ideal method, but this machinery is so expensive that in a large number of cases in our Province it is advisable to cut by hand. The farmer could start cutting the corn a day or two in advance; this would place the man cutting so far ahead of the hauler, that he would be able to finish the work alone.

WATER.

There is more danger of damaged silage from lack of water than from adding too much. The Department's representative filled a silo at Revelstoke with corn which was badly frozen. The water was continually running on the silage during filling, and for two or three hours after the day's work was done, with no apparent damage to the silage. Trials have shown that very dry fodder requires an equal amount of water. The feed in the silo should be moist enough to dampen the shoes of the man who is tramping the silage. The matter of the quantity of water depends on the amount of moisture in the crop, and what quantity should be added, if any, will have to be left to the judgment of the farmer upon whose farm the silo is being filled.

TRAMPING THE ENSILAGE.

Too much emphasis cannot be laid upon the necessity of spreading and tramping the ensilage, especially around the walls of the silo. The more air there is left in the crop when placed in the silo, the higher will be the temperature during fermentation, and hence the greater loss of food ingredients will occur. In preparing silage for young cattle, you are somewhat in the same position as the housewife who lays aside the canned or bottled fruit for winter use. After harvesting the crop, you must attend to the amount of moisture in it and see, when placing it in the silo, that it is thoroughly tramped, so that too much air is not left among the cut material. A few inches always decomposes on the top of the silo; this forms a natural sealer, and if the walls of your silo are air-tight your product will be good, succulent feed.

COVERING FOR CROP.

Sufficient attention is not as a rule given to the silage which is left on the surface when the farmer leaves the silage to be fed later in the season. This varies from 4 to 12 inches. When we consider that in some silos 1 inch depth of silage weighs 500 lb., you can see that care is necessary. A good method is to put a load of straw through the silage-cutter; if you have a crop of weeds on the farm, this would also make a good cover. While the crop is going through the process of ensiling it gradually settles. The farmer should go up into the silo twice a day for two or three days after filling, and tramp the silage. Water thrown over the surface of the silage aids greatly the successful sealing of the silo.

FEEDER CONTROLS COST OF FILLING.

It requires a man of good judgment and energy a little above the ordinary to keep the silage-cutter running smoothly, and to see that there is as little delay as

possible around the machine, with the wagons which are hauling the crop. Providing the silo is built to the necessary requirements, the cost of filling depends to a large extent upon the man who is feeding; ten minutes' delay through the blower-pipe choking or not keeping the cutter up to its capacity is quite an item when applied to seven or eight men and three or four teams and wagons.

WHEN TO FEED SILAGE.

Some farmers commence to feed the silage as soon as the silo is filled; by this means there is no loss on the top. It takes from five to twelve days for the changes which take place in the crop before the process of making silage is completed; after this there are no changes of note.

Dairy cows	25 to 40 lb.
Heifers and beef stock	10 to 20 lb.
Fattening steers and beef cows	20 to 30 lb.
Horses	5 to 10 lb.
Wintering work-horses	10 to 20 lb.
Sheep	3 to 5 lb.
Brood sows	2 to 3 lb.

NOTE.—In feeding silage to horses and mules it is important to pick out mouldy or decayed silage, as fatal results may follow the feeding of such silage. Other stock seem less sensitive to it, but it is better not to feed it.



The first silo-filling demonstration conducted by Department officials in the Interior of the Province.

COMPARISON OF THE CAPACITY OF MOW AND SILO.

It is interesting to compare the difference between the quantity of dry hay that can be stored in the barn with the capacity of the silo. A cubic foot of hay in the mow weighs 5 lb. An average cubic foot of silage in a 30-foot silo weighs 40 lb. If hay contains 86.8 per cent. and silage 26.3 per cent. of dry matter, then 1 cubic foot of silo-space would store two and one-half times as many pounds of nutrients as the same space in the mow.

VALUE OF SILAGE.

Silage and other succulent feeds have a higher value than indicated by the nutrients they contain, on account of the favourable effect of succulence upon the

digestive organs of the animal. The acids which are produced through the formation of silage assist in the digestion not only of the silage, but the other feeds which are being fed to the animal. The cost to produce silage, according to experiments conducted before the war, was estimated at about \$3 per ton, and it had a feeding value computed at \$7.50 per ton. Both these figures have been increased, considering the cost of producing the crops, also the high-priced labour of the present day.

CORN SILAGE AND ALFALFA-HAY FOR THE OKANAGAN.

There is, perhaps, no better single dairy feed than alfalfa, and rich alfalfa pasture or a good quality of alfalfa-hay can hardly be improved upon for dairy cattle. The practice of feeding corn silage as a supplementary feed to cattle is being adopted by a number of farmers in our Province, and giving excellent results. An experiment was carried on at the University of California for four weeks with a number of cattle, in order to show the relative value of feeding cattle silage and alfalfa-hay, compared with silage, alfalfa-hay, and grain. There was no difference in the yield of milk, but the cattle fed grain had a very slight advantage in solids and fat. There was no appreciative difference in the relative efficiency of the rations as to the production of the cows that received grain and those fed roughage only. Further experiments are to be conducted. Corn and alfalfa can be grown in the Okanagan which will rival, if not surpass, any that is grown in the Southern States; this places a splendid opportunity before the farmers in this district. A large number of silos have been built around Kelowna during the last two years. A large number of farmers are contemplating building silos in the Okanagan this year.

BEEF CATTLE.

For growing, wintering, and fattening beef cattle no roughage may be of more value than silage when properly used. In combination with alfalfa or clover hay it keeps the stomach of the animal well regulated, and the animal ready to respond to changes in feeding designed to promote growth or to prepare for beefing. We have large areas in this Province where the stock are fed hay as the sole roughage during the winter. Breeding stock often lose the offspring through malnutrition when fed nothing but dry roughage throughout the winter. If our stockmen would build silos and store large quantities of succulent silage, it would mean strong, healthy animals, and they would naturally be of increased weight when ready for the block.

COMPOSITION OF SUCCULENT ROUGHAGE.

(Average amount in 100 lb.)

Crop.	Total Dry Matter.	DIGESTIBLE DRY MATTER.			Total Digestible Nutrients.
		Protein.	Carbo- hydrates.	Fat.	
	Lb.	Lb.	Lb.	Lb.	Lb.
Green fodder corn	21.9	1.0	12.8	0.4	14.7
Corn silage	26.3	1.1	15.0	0.7	17.7
Uncured red clover	27.5	2.7	13.8	0.7	18.1
Clover silage	27.8	1.3	9.5	0.5	11.9
Alfalfa	25.3	3.3	10.4	0.4	14.6
Uncured oats and peas	22.6	2.4	10.6	0.6	14.4
Oats and peas silage	27.5	2.8	12.6	1.0	17.6
Mangels	9.4	0.8	6.4	0.1	7.4

—"Feeds and Feeding," by W. A. Henry.

CONSTRUCTION OF STAVE SILOS.

This table shows the capacities and the exact amounts of materials necessary in the construction of different stave silos, apart from the foundation.

Size.	Capacity.	LUMBER.					HARDWARE.						Yards Hoofing.
		No. of 2" x 6".	No. of 2" x 4".	No. of 4" x 6".	No. of 2" x 2".	Amount 1" x 12".	No. of Rods.	Length of Rods.	Nails, 2 1/2".	Nails, 3".	Strap-hinges, 3" x 9".	2 1/2" No. 155 Staples.	
Feet.	Tons.					Feet.		Ft. in.	Lb.	Lb.			Gross.
8x20	20	53	6			100	21	9 0 1/2	7	3	6	2	17
9x20	25	57	6			100	21	10 1	8	3	6	2	19
9x24	30	57	6			210	24	10 1	8	3	6	2	19
9x26	33	57	6			225	27	10 1	8	3	6	2	19
10x20	32	66	6			210	24	11 2	8	3	6	2	21
10x24	37	66	6			230	27	11 2	8	3	6	2	21
10x26	40	66	6			240	27	11 2	8	4	6	2 1/2	21
10x28	44	66	6			255	30	11 2	8	4	6	2 1/2	21
10x30	47	66	6			270	33	11 2	8	4	6	2 1/2	21
11x20	38	71	6			215	24	12 6	8	3	6	2	22
11x22	43	71	6			225	24	12 6	8	3	6	2	22
11x24	46	71	6			240	27	12 6	8	4	6	2	22
11x26	49	71	6			255	27	12 6	8	4	6	2 1/2	22
11x28	53	71	8			265	30	12 6	8	4	6	2	22
11x30	57	71	8			280	23	12 6	10	5	6	2	22
12x22	50	78	8			235	36	10 0 1/2	8	4	6	2 1/2	23
12x24	54.5	78	8			250	36	10 0 1/2	8	4	6	2 1/2	23
12x26	59	78	8			265	40	10 0 1/2	10	5	6	2 1/2	23
12x28	64	78	8			275	40	10 0 1/2	10	5	6	2 1/2	23
12x30	68	78	8			290	44	10 0 1/2	10	5	6	2 1/2	23
13x24	63.5	82	8			260	36	10 10	8	4	6	2	27
13x26	69	82	8			275	36	10 10	10	5	6	2 1/2	27
13x28	74	82	8			290	40	10 10	10	5	6	2 1/2	27
13x30	79	82	8			309	44	10 10	10	5	6	2 1/2	27
14x26	80	89	8			285	40	11 7 1/2	10	5	6	2 1/2	30
14x28	86	89	8			295	44	11 7 1/2	10	5	6	2 1/2	30
14x30	92	89	8			305	44	11 7 1/2	10	5	6	2 1/2	30
15x26	92	95	8			295	40	12 5	10	5	6	2 1/2	32
15x28	99	95	8			310	40	12 5	10	5	6	2 1/2	32
15x30	106	95	8			320	44	12 5	10	5	6	2 1/2	32
15x32	113	95	8			335	44	12 5	12	6	6	4 1/2	32
16x26	104	104	8			305	40	13 2	12	6	6	4	34
16x28	112	104	8			315	44	13 2	12	6	6	4	34
16x30	120	104	8			330	44	13 2	12	6	6	4	34
16x32	128	104	8			345	48	13 2	12	6	6	4 1/2	34
16x34	136	104	8			360	48	13 2	12	6	6	4 1/2	34

2" x 6"—2" x 4"—4" x 4"—2" x 2" to be as long as silo is high.
Two nuts and two malleable washers for each rod.
Rods to be bent to the circumference of silo.

SILO HISTORY.

The word "silo" came from the Greek *siros*—a pit or hole sunk in the ground for keeping corn in. Then *siros* became latinized into *sirus*, and in turn *sirus* in Spanish and French was corrupted into *silos*, or, as is found in old books of these languages, *silo*; and in Spanish there is the verb *ensilar*, which signifies the putting of corn into the silo; and the French gave the term *ensilage* to the material thus stored away. The father of modern ensilage, M. Goffart, was practically the first to use it. As to silos and ensilage being modern inventions, it is, on the contrary, as old as the Pharaohs, and possibly Noah in the Ark fed his cattle compressed silage. The old naturalist Pliney mentions it as being known in Thrace and Cappadocia. The Roman generals in Africa and Spain (he says) dug holes in the dry ground, spread chaff or stubble underneath, and laid up grain in the ear in them. Most of the Greek authors—Euripides, Thesphrastus, Hesychim, and Suidas—speak of the *siros* or *silos*. Amongst the Eastern nations ensilage has been largely used. In Barbary often 200 or 300 have been found together, the smallest holding 400 bushels. In Egypt a similar method has been in vogue for ages. Colonel Burnaby

in his "Ride to Khiva," and Mr. O'Donovan in his "The Merry Oasis," both refer to the subject. The Colonel tells how he met a party of men and women on the road to Khiva who were engaged in unearthing a quantity of grass from a deep cutting in the ground. The grass had been mowed the previous autumn, and was thus preserved until such time as the owner required it; the grass was as fresh as the day it was cut. It is remarkable that the Kafir word for a grain-pit is *essiele*, which seems to have affinity with "silo." The South Sea Islanders have long practised the ensiling of breadfruit, taro, yams, etc. The Mexicans knew all about silos centuries ago.

But we could write a whole book on this subject. This will probably suffice; but will it suffice to induce some of our farmers to rise to the wisdom of our savage ancestors and build silos?

VICTORIA, B.C.:

Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1918.